Erosion control and forest roads

Basic concepts:
1. Build forest roads properly
2. Good construction reduces erosion significantly
3. Make sure roads and skid trails are built to move small amounts of water short distances
4. Properly built roads need not be expensive.

This article details the ways in which loggers and forest owners should prepare and maintain forest roads.

Forest roads provide the most important means of accessing forests for timber harvesting, recreation, and hiking. Unfortunately, forest roads cause more erosion than any other aspect of logging. When sediment washes away from timber harvesting operations, it usually starts from erosion along poorly built forest roads.

Even though forest roads are important for harvesting timber, reforestation, recreation, and forestry projects, they should be placed only where necessary. Avoid building new roads in forests if it is not necessary.

The basic problem of forest roads is that they create a hard, compact surface within woodlands. Forest soils are naturally permeable and sponge-like. Forest roads, on the other hand, are much more impervious, causing water from rain and snow melt to run across the surface, rather than soaking in. Uncontrolled surface runoff washes away thousands of tons of soil over time. Eroded soil cannot be replaced without a great deal of expensive and time-consuming effort. If the surface water is controlled, forest soil remains in place, providing a good foundation for future forest growth.

3 types of forest roads:
Temporary roads - These are the most common type of forest road. They are designed and constructed for short-term use during a specific project such as timber harvesting. These roads are used only when the ground is frozen or firm. When the project is done, the temporary road is closed, all stream crossing structures are removed, and the road is naturally or artificially revegetated.

Permanent seasonal roads - These are maintained as part of the permanent road system but are designed for use only when the ground is frozen or firm.
Permanent all-season forest roads - These roads usually have gravel surfaces and are designed for year-round use. However, there may be some restrictions on use at various times of the year.


Forest road best management practices

Use existing roads
After a walk over the land, and after reviewing maps, aerial photographs, and soil surveys, forest owners should have plenty of information to find and mark existing forest roads. These roads often provide the best access to a timber harvest site. If so, inspect the grade and slope of the road so that they move small amounts of water short distances. Technicians from the county Soil and Water Conservation District office can help you with technical information and on-site assistance.

If an existing road is unsuitable for use (poorly constructed, wrong location), first make sure the old road is stabilized and will not create a future erosion hazard. Use the information gathered about sensitive areas and slopes to design and locate a new forest road.

Consider accessing a harvest area through adjacent land to avoid steep slopes or stream crossings. If a neighbor’s property is involved somehow, get written, dated permission from the neighbor allowing the logger to move their equipment accordingly.

Plan routes for new roads
New forest roads should be built in as few places as possible. Minimize the length and width of the road to fit the equipment being used on-site. Planning can reduce skid road area by 40% compared to unplanned skid roads. Technicians from the county Soil and Water Conservation District office can help you with technical information about forest road construction and on-site assistance.

Match the road to the type of equipment in use.
Refer to these guidelines for choosing what kind of road will be constructed:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Slope of operation</th>
<th>Turning radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skid road</td>
<td>30% slope</td>
<td>maximum 25 feet</td>
</tr>
<tr>
<td>Forwarder road</td>
<td>20% slope</td>
<td>maximum 35 feet</td>
</tr>
<tr>
<td>Log truck road</td>
<td>20% slope</td>
<td>maximum 50 feet</td>
</tr>
<tr>
<td>Log trailer road</td>
<td>20% slope</td>
<td>maximum 100 feet</td>
</tr>
</tbody>
</table>

On a topographic map, count the number of contour intervals crossed by a potential forest road. The fewer contour line crossings are better. The fewer contour line crossings are better.
Control points to use for forest road routes

Ridges Usually provide good locations
Saddles Dip in the ridgeline good for crossing over ridge
Benches Flat portion of hillside - good for switchbacks, intersections, and landings
Start / end Should be identified on maps
Property lines Keep road clearly on the proper side of a boundary

Control points to avoid with forest road routes

Streams Avoid crossing; cross directly at narrow points; leave a buffer zone between road and stream
Wet seeps Avoid
Rock outcrops Cross above or below
Steep slopes Avoid or use switchbacks on benches

Avoid streams, wetlands, steep areas, and ponds with new roads. If the road has to run close to a stream or other surface water, plan on maintaining a filter strip, 10 - 40 feet wide. This filter strip will capture sediment before it runs into the water.

New roads should follow gentle slopes. On steeper hillsides, a series of planned switchbacks will help avoid long, straight runs.

On steep slopes, consider constructing one main skid road with lots of erosion control, joined by several gently sloping skid roads.

Install water control features within the roadway

There are many types of water control features for forest roads (and skid trails):

Broad based dip
A broad based dip is a wide depression in the road designed to divert water off a sloping roadway. It is broad enough to accommodate hauling equipment easily, yet move water off the road to disperse in the forest. They are constructed as the forest roadway is being built, not dug in afterwards. Cull logs can be embedded in the mound, perpendicular to the roadway, reinforcing the berm.

A broad based dip should be placed on forest roads with long, continuous slopes. The idea is to collect water running down or near the road and redirect it off the road, to soil where it will slowly soak in.

Pipe culverts
A pipe culvert is a permanent conduit for water that must travel under a forest road, rather than over. It collects water from small streams, intermittent waterways, and roadside ditches and drains.
it on the downhill side. Although they can be expensive to install, they are very effective in controlling erosion. The decision to place one under a new road should be based on expected traffic, and how many acres are being drained. Make sure the sides of the culvert are compacted. During heavy rains, a culvert will make the difference between a stable or washed-out road.

**Open-top culverts**
Where a forest road needs surface drainage, an open-topped culvert provides good water control at low cost. These stabilized "mini-ditches" cross the road, but are narrow enough to allow vehicles to cross over. When built, they should be angled downslope, not straight across the road. Because they are shallow and unprotected, they need to be cleaned out periodically to keep water flowing through, not around.

**Rubber deflectors**
Rubber belting, attached to and reinforced by timbers, can help divert water off a gently sloping forest road. Like open-top culverts, they are angled downslope so water can move off the road quickly. Rubber deflectors allow equipment to pass over without interference. These structures work better on forest roads that are not maintained and have a low volume of traffic. The area receiving water from a rubber deflector should be stabilized with cobblestone to prevent erosion at the lower tip of the deflector.

**Diversion ditches / Turn outs / Turn ups**
Smaller forest roads and skid trails can be stabilized by redirecting water toward a vegetated area, rather than down the track of a forest road. With a combination of easily-installed ditches, turnouts, and turn-ups, a forest road controls water flow and prevents erosion. In a sense, the forest road appears to "wiggle" through the woods, shedding water at each small slope and turn.

A turn-out directs the water off the side of the skid road, whereas a sloping turn up sheds water at its base.

**Rolling dips**
Rolling dips are broad, angled portions of a forest road that shed water off to the side, rather than down the length of the road. With rolling dips, a forest road appears to pitch gently from side to side, while maintaining a straight course through the woods. This technique is also called outsloping.
Use the proper cross-section
The location and position of the road will help determine which cross section will be most effective in controlling erosion. Grade the road to create good drainage. Direct water that drains to flow without force off to more stable ground. The insloped road should include a catch ditch and a culvert designed to move the water back underneath the road.

Change operations when weather conditions decline
Shut down log skidding and hauling when the soil is saturated and unable to support the equipment. In a good logging job, skidders and bulldozers should be supported by soil, not slogging through it. When forest soils cannot support the equipment, focus the logging efforts on machinery maintenance, planning, and preparation. Logging crews throughout New York lose thousands of hours of work time trying to pull out stuck equipment and repairing deep ruts. There is a point where skidding costs exceed site damage and are not worthwhile. In some cases, logging crews have been barred from future work in forests due to poor judgment regarding forest road conditions.

The booklet, "Best Management Practices During Timber Harvesting Operations" (1997) was created by the Chemung County Soil and Water Conservation District. It is a thorough resource, describing and depicting many different kinds of forest road considerations to be used at the harvesting stage of forest management. If you are contemplating a timber sale, considering purchasing one of these booklets from Chemung County SWCD (607) 739-2009.
Open top culvert

Pipe culvert construction
Effective forest road shape and surface

Open top culvert image from WI DNR archives
Road photo by James Kochenderfer

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